

CR800-Series Specifications

Electrical specifications are valid over a -25° to +50°C, non-condensing environment, unless otherwise specified. Recalibration recommended every three years. Critical specifications and system configuration should be confirmed with Campbell Scientific before purchase.

PROGRAM EXECUTION RATE

10 ms to one day @ 10 ms increments

ANALOG INPUTS (SE1-SE6 or DIFF1-DIFF3)

3 differential (DIFF) or 6 single-ended (SE) individually configured input channels. Channel expansion provided by optional analog multiplexers.

RANGES and RESOLUTION: Basic resolution (Basic Res) is the resolution of a single A/D conversion. A DIFF measurement with input reversal has better (finer) resolution by twice than Basic Res.

Range (mV) ¹	DIFF Res (μV) ²	Basic Res (μV)
±5000	667	1333
±2500	333	667
±250	33.3	66.7
±25	3.33	6.7
±7.5	1.0	2.0
±2.5	0.33	0.67

¹Range overhead of ~9% on all ranges guarantees that full-scale values will not cause over range.

²Resolution of DIFF measurements with input reversal.

ACCURACY³:

±(0.06% of reading + offset), 0° to 40°C

±(0.12% of reading + offset), -25° to 50°C

±(0.18% of reading + offset), -55° to 85°C (-XT only)

³Accuracy does not include sensor and measurement noise.

Offsets are defined as:

Offset for DIFF w/input reversal = 1.5-Basic Res + 1.0 μV

Offset for DIFF w/o input reversal = 3-Basic Res + 2.0 μV

Offset for SE = 3-Basic Res + 3.0 μV

ANALOG MEASUREMENT SPEED:

Integration Type/ Code	Integration Time	Settling Time	Total Time ⁴	
			SE w/ No Rev	DIFF w/ Input Rev
250	250 μs	450 μs	~1 ms	~12 ms
60 Hz ⁵	16.67 ms	3 ms	~20 ms	~40 ms
50 Hz ⁵	20.00 ms	3 ms	~25 ms	~50 ms

⁴Includes 250 μs for conversion to engineering units.
⁵AC line noise filter.

INPUT NOISE VOLTAGE: For DIFF measurements with input reversal on ±2.5 mV input range; digital resolution dominates for higher ranges.

250 μs Integration: 0.34 μV RMS

50/60 Hz Integration: 0.19 μV RMS

INPUT LIMITS: ±5 V

DC COMMON MODE REJECTION: >100 dB

NORMAL MODE REJECTION: 70 dB @ 60 Hz when using 60 Hz rejection

INPUT VOLTAGE RANGE W/O MEASUREMENT

CORRUPTION: ±8.6 Vdc max.

SUSTAINED INPUT VOLTAGE W/O DAMAGE: ±16 Vdc max.

INPUT CURRENT: ±1 nA typical, ±6 nA max. @ 50°C;

±90 nA @ 85°C

INPUT RESISTANCE: 20 GΩ typical

ACCURACY OF BUILT-IN REFERENCE JUNCTION

THERMISTOR (for thermocouple measurements):

±0.3°C, -25° to 50°C

±0.8°C, -55° to 85°C (-XT only)

ANALOG OUTPUTS (VX1-VX2)

2 switched voltage outputs sequentially active only during measurement.

RANGE AND RESOLUTION:

Channel	Range	Resolution	Current Source/Sink
(VX 1-2)	±2.5 Vdc	0.67 mV	±25 mA

Voltage outputs programmable between ±2.5 V with 0.67 mV resolution.

ANALOG OUTPUT ACCURACY (VX):

±(0.06% of setting + 0.8 mV), 0° to 40°C

±(0.12% of setting + 0.8 mV), -25° to 50°C

±(0.18% of setting + 0.8 mV), -55° to 85°C (-XT only)

Vx FREQUENCY SWEEP FUNCTION: Switched outputs provide a programmable swept frequency, 0 to 2500 mv square waves for exciting vibrating wire transducers.

PERIOD AVERAGE

Any of the 6 SE analog inputs can be used for period averaging. Accuracy is ±(0.01% of reading + resolution), where resolution is 136 ns divided by the specified number of cycles to be measured.

INPUT AMPLITUDE AND FREQUENCY:

Voltage Gain	Input Range (±mV)	Input Signal (peak to peak)		Min Pulse Width (μV)	Max ⁸ Freq (kHz)
		Min (mV) ⁶	Max (V) ⁷		
1	250	500	10	2.5	200
10	25	10	2	10	50
33	7.5	5	2	62	8
100	2.5	2	2	100	5

⁶Signal centered around *Threshold* (see *PeriodAvg()* instruction).
⁷Signal centered around datalogger ground.
⁸Maximum frequency = 1/(twice minimum pulse width) for 50% of duty cycle signals.

RATIOMETRIC MEASUREMENTS

MEASUREMENT TYPES: Provides ratiometric resistance measurements using voltage excitation. Three switched voltage excitation outputs are available for measurements of 4- and 6-wire full bridges, and 2-, 3-, and 4-wire half bridges. Optional excitation polarity reversal minimizes dc errors.

RATIOMETRIC MEASUREMENT ACCURACY:^{9,10,11}

±(0.04% of voltage measurement + offset)

⁹Accuracy specification assumes excitation reversal for excitation voltages < 1000 mV. Assumption does not include bridge resistor errors and sensor and measurement noise.

¹⁰Estimated accuracy, ΔX (where X is value returned from the measurement with Multiplier = 1, Offset = 0):

BrHalf() instruction: ΔX = ΔV_x/V_x

BrFull() instruction: ΔX = 1000·ΔV_x/V_x, expressed as mV·V⁻¹.

ΔV⁻¹ is calculated from the ratiometric measurement accuracy. See *Resistance Measurements Section in the manual for more information*.

¹¹Offsets are defined as:

Offset for DIFF w/input reversal = 1.5-Basic Res + 1.0 μV

Offset for DIFF w/o input reversal = 3-Basic Res + 2.0 μV

Offset for SE = 3-Basic Res + 3.0 μV

Excitation reversal reduces offsets by a factor of two.

PULSE COUNTERS (P1-P2)

2 inputs individually selectable for switch closure, high frequency pulse, or low-level ac. Independent 24-bit counters for each input.

MAXIMUM COUNTS PER SCAN: 16.7 x 10⁶

SWITCH CLOSURE MODE:

Minimum Switch Closed Time: 5 ms

Minimum Switch Open Time: 6 ms

Max. Bounce Time: 1 ms open w/o being counted

HIGH FREQUENCY PULSE MODE:

Maximum Input Frequency: 250 kHz

Maximum Input Voltage: ±20 V

Voltage Thresholds: Count upon transition from below 0.9 V to above 2.2 V after input filter with 1.2 μs time constant.

LOW LEVEL AC MODE: Internal ac coupling removes dc offsets up to ±0.5 V.

Input Hysteresis: 12 mV @ 1 Hz

Maximum ac Input Voltage: ±20 V

Minimum ac Input Voltage:

Sine Wave (mV RMS)	Range(Hz)
20	1.0 to 20
200	0.5 to 200
2000	0.3 to 10,000
5000	0.3 to 20,000

DIGITAL I/O PORTS (C1-C4)

4 ports software selectable, as binary inputs or control outputs. Provide on/off, pulse width modulation, edge timing, subroutine interrupts/wake up, switch closure pulse counting, high-frequency pulse counting, asynchronous communications (UARTs), SDI-12 communications, and SDM communications.

LOW FREQUENCY MODE MAX: <1 kHz

HIGH FREQUENCY MAX: 400 kHz

SWITCH CLOSURE FREQUENCY MAX: 150 Hz

EDGE TIMING RESOLUTION: 540 ns

OUTPUT VOLTAGES (no load): high 5.0 V ±0.1 V; low <0.1

OUTPUT RESISTANCE: 330 Ω

INPUT STATE: high 3.8 to 16 V; low -8.0 to 1.2 V

INPUT HYSTERESIS: 1.4 V

INPUT RESISTANCE:

100 kΩ with inputs <6.2 Vdc

220 Ω with inputs ≥6.2 Vdc

SERIAL DEVICE / RS-232 SUPPORT: 0 to 5 Vdc UART

SWITCHED 12 V (SW12)

One independent 12 Vdc unregulated source is switched on and off under program control. Thermal fuse hold current = 900 mA @ 20°C, 650 mA @ 50°C, 360 mA @ 85°C.

EU DECLARATION OF COMPLIANCE

https://campbellsci.com/documents/us/compliance/eudoc_cr800-series.pdf

COMMUNICATIONS

RS-232 PORTS:

DCE 9-pin: (not electrically isolated) for computer connection or connection of modems not manufactured by Campbell Scientific.

COM1 to COM2: Two independent Tx/Rx pairs on control ports (non-isolated); 0 to 5 Vdc UART

Baud Rate: selectable from 300 bps to 115.2 kbps.

Default Format: 8 data bits; 1 stop bits; no parity

Optional Formats: 7 data bits; 2 stop bits; odd, even parity

CS I/O PORT: Interface with telecommunication peripherals manufactured by Campbell Scientific

SDI-12: Digital control ports C1 or C3 are individually configurable and meet SDI-12 Standard version 1.3 for datalogger mode. Up to 10 SDI-12 sensors are supported per port.

PROTOCOLS SUPPORTED: PakBus, AES-128 Encrypted PakBus, Modbus, DNP3, FTP, HTTP, XML, HTML, POP3, SMTP, Telnet, NTCIP, NTP, Web API, SDI-12, SDM

SYSTEM

PROCESSOR: Renesas H8S 2322 (16-bit CPU with 32-bit internal core running at 7.4 MHz)

MEMORY: 2 MB of flash for operating system; 4 MB of battery-backed SRAM for CPU usage, program storage and final data storage

RTC CLOCK ACCURACY: ±3 min. per year. Correction via GPS optional.

RTC CLOCK RESOLUTION: 10 ms

SYSTEM POWER REQUIREMENTS

VOLTAGE: 9.6 to 16 Vdc

INTERNAL BATTERIES: 1200 mA h lithium battery for clock and SRAM backup, typically provides 3 years of backup

EXTERNAL BATTERIES: Optional 12 Vdc nominal alkaline and rechargeable available. Power connection is reverse polarity protected.

TYPICAL CURRENT DRAIN @ 12 Vdc:

Sleep Mode: 0.7 mA typical; 0.9 mA max.

1 Hz Sample Rate (1 fast SE measurement): 1 mA

100 Hz Sample Rate (1 fast SE measurement): 16.2 mA

100 Hz Sample Rate (1 fast SE meas w/RS-232 communication): 28 mA

Active external keyboard display adds 7 mA (100 mA with backlight on).

PHYSICAL

DIMENSIONS: 24.1 x 10.4 x 5.1 cm (9.5 x 4.1 x 2 in); additional clearance required for cables and leads.

WEIGHT: 0.7 kg (1.5 lb)

WARRANTY

3-years against defects in materials and workmanship.



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